Magnetic Excitation Spectra of the Novel Spin-orbit-coupled Mott Insulator Sr_2IrO_4

B. J. Kim

Material Science Division, Argonne National Laboratory, Argonne, IL 60439

Strong relativistic spin−orbit coupling (SOC) in 5d transition metal oxides provides a new route to realizing novel magnetic systems. Depending on the lattice geometry, expected magnetic systems range from conventional Heisenberg magnets to the more exotic Kitaev model and the topological Mott insulator. In the particular case of square lattice geometry relevant for Sr_2IrO_4, the superexchange interactions among the spin-orbit entangled electrons form a Heisenberg antiferromaget, rendering the low energy physics much akin to that in the high-temperature superconducting curpates. In this talk, I will present the magnetic excitation spectra of Sr_2IrO_4, a magnon branch of which shows striking similarities to that in the cuprates. Further, novel high-energy, spin-orbit entangled modes that arise from the SOC are found in Sr_2IrO_4, which may provide extra interaction channels for doped carriers.